ANALOG DEVICES

AN-421
APPLICATION NOTE

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High Speed Data Acquisition Using the RTI®-2100 Series

by Jim Maxwell

Q: The RTI-2100-LC is a very low priced DAQ board for 500 kHz throughput. Is there a catch?

A: There is no "catch." You get a 16-channel, 500 kHz aggregate throughput, 12-bit data acquisition card with an onboard Analog Devices DSP, 24 lines of Digital I/O, external clocking, and external triggering capabilities. Also included is the Quick Start RTI-STAT software package with an advanced data acquisition program, pull-down menus and on-line manual. RTI-STAT is provided in DOS and Windows versions. The secret to the low price is in the RTI-2100's unique blend of DSP processor and high density ASIC technology.

Q: What is the RTI-DAQ?

A: RTI-DAQ is an optional software package that allows the user to program all board functions using higher level languages. Included are drivers for DOS, Windows™ 3.1, Windows 95 and Windows NT. The DOS drivers and subroutine libraries support Microsoft C/C++, QuickC, QuickBASIC, FORTRAN, Borland C/C++, and Turbo Pascal. The Windows drivers and DLLs support Microsoft C/C++, QuickC for Windows, Visual C/C++, Visual Basic, Borland C/C++ for Windows, TurboC for Windows and Turbo Pascal for Windows. The Windows software utilizes enhanced mode operation and requires a 386 or higher PC.

Q: What size FIFO do you have on the RTI-2100?

A: The FIFO holds 1024 16-bit samples. Note that this doesn't mean that you can only acquire 1024 samples at 1 MHz! The RTI-2100 can acquire as many samples as you have available PC memory at 1 MHz! All the FIFO buffer does is increase the efficiency of the data transfer operation. In fact, the FIFO is an order of magnitude larger than is needed even for operation under Windows. Since the RTI-2100 can transfer data across the ISA bus at full throughput, it uses the PC's memory for data storage. This eliminates expensive memory daughter cards with secondary busses, wasted PC slots, and huge amounts of onboard memory that is only usable for data acquisition. The FIFO is only used to accumulate data until a "block" data transfer is made. It also accounts for unexpected bus access delays.

Q: How do you get 1 MHz throughput using DMA? I thought 250 kHz was as fast as DMA on the PC's ISA bus could go.

A: By using an RTI-2100 feature called "Block Mode Transfer." Actually, the maximum throughput using conventional DMA transfer methods is 330 kHz. By using Block Mode DMA transfers, we can achieve continuous throughput to host memory at 909 kHz (worst case measured on a 16 MHz 386SX PC). With our data packing feature, this becomes 1.2 MHz—well over the RTI-2100's maximum speed of 1 MHz. Conventional DMA methodology is: to acquire the PC bus (1 µs), perform a single transfer (800 to 950 ns) and to release the PC bus (1 µs). This results in approximately 3 µs per 16-bit transfer. With Block Mode DMA, the onboard FIFO accumulates 682 samples (packed into 512, 16-bit words) and generates a DMA request. This request starts the transfer. The PC bus is acquired (1 µs), 682 transfers are performed (800 µs to 950 µs × 512) and release the PC bus (1 µs). Conventional mode would require approximately 2 ms for 682 samples to be transferred whereas Block Mode only requires approximately 490 µs.

Q: What is this "Rep String" operation you keep talking about?

A: The "Rep String" (REP INSW) is a 80286, 386, 486 and Pentium command that puts the CPU into a zero overhead loop doing 16- or 32-bit I/O operations. The host CPU can access data across the PC bus in 250 ns to 350 ns. With a 16-bit "Rep String" transfer, when the FIFO is half full (682 samples packed into 512, 16-bit words), an interrupt is generated that activates the "Rep String" operation. The data is then written into host memory in approximately 230 µs [512 transfers × 450 ns/transfer . . . based on 350 ns bus read + 100 ns

memory write]. The 32-bit "Rep String" operation works in a similar fashion as the 16-bit "Rep String," except the CPU writes *two* 16-bit words into memory with one 100 ns memory write. Using this, it takes approximately 205 ns to transfer the 682 samples [256 × 800 ns/transfer based on 350 ns bus read +350 ns bus read +100 ns for *both* memory writes]. The 16-bit "Rep String" top speed is 2.2 MWords/sec (2.93 MWords packed), and the 32-bit "Rep String" top speed is 2.5 MWords/sec (3.33 MWords packed). These are both well over the maximum throughput rate of the RTI-2100 series' hardware.

Q: You say this board is specifically designed for Windows 3.1, Windows 95 and Windows NT. What makes your data acquisition board so well suited for Windows?

A: The Windows 3.1 and Windows 95 operating systems manage all of a PC's resources, including its memory. Windows 3.1 has two difficulties with memory: memory paging and DMA usage. Its memory paging is set to 4k pages, which inhibits DMA from having fully flexible memory access. The DMA controller effectively has to be reprogrammed for each 4k page. Other, less flexible solutions do exist. DMA can be done by: using Windows' double buffered DMA scheme (half the speed), allocating memory up front (which can't be used by other programs) and by allocating DOS memory (which reduces the amount of memory available in DOS boxes). The solution is "Rep String." Since the Rep String operation doesn't use DMA, these problems aren't present. Windows NT has the same problems and the same answer, except the ability to allocate DOS memory has been removed.

Q: Does RTI-DAQ support multiple boards in the same system?

A: RTI-DAQ supports up to eight boards in the same system. The Rep String operation is very helpful with this functionality also. With "standard" DMA style data transfers, there are three DMA channels normally used (5, 6 and 7). The "Old Fashioned" dual DMA, "Gap-Free" transfer methodology makes multiple boards in the same system an impossibility. Since two channels are used per board for continuous throughput, and there are only three channels available, the second board would have to run using only one channel. This second card's data would have gaps while the DMA controller is being reprogrammed to a new buffer. Be aware, however, that the ability to have eight RTI-2100 boards installed in a single system doesn't mean that the system bus would be capable of handling all of them at maximum throughput at the same time. As mentioned above, most PCs are limited to approximately 2.93 MWords/sec. This means that, at most, two RTI-2100 boards could run at maximum throughput at the same time.

Q: What about the EISA bus? Can the RTI-2100 run on an EISA bus computer?

A: The RTI-2100 will run in an EISA bus PC. Its physical dimensions conform to the EISA specification. The EISA bus has a "dual-level" connector in it. The top "level" has the connections that mimic an ISA bus. The bottom "level" is where an EISA bus board's connections are made. You can easily distinguish between EISA bus and ISA bus boards by the length of the interface connector. When a RTI-2100 is plugged into an EISA bus PC, it makes connections to the ISA part of the connector. The RTI-2100 will not take advantage of the EISA bus's 32-bit data path; however, its ability to run at bus speeds up to 32 MHz means it can use much of the EISA bus's greater bandwidth.

Q: What kind of DSP is on the RTI-2100?

A: The RTI-2100 series uses the Analog Devices ADSP-2101 chip. This is a 16-bit, fixed point, 12.5 MIPS chip with 2 kByte × 24-bit of program memory and 1 kByte × 16-bit of data memory. The DSP acts as the brains of the data acquisition hardware by controlling the channel switching, gain switching, data movement and data packing. About one third of the 2101's resources are used to do this at a 1 MHz A/D sampling rate. The remaining two thirds can be used to perform various functions such as sample averaging and filtering. The slower your A/D sampling rate is, the more DSP horsepower is available to you.

Q: Can I program the DSP, and if so how?

A: Yes, the DSP can be programmed by the user. To help you with this, you will need the RTI-DSPDS software and the Analog Devices' model ADD-21xx-SW-PC Assembler, Simulators, and C Tools Package (for IBM PC). The RTI-DSPS software includes the download code and routines for programming the ADSP-2101 DSP processor.

Q: The RTI-2100 series has a "block mode" acquisition capability. What is it?

A: With most data acquisition cards on the market, a single A/D conversion occurs every time an A/D converter strobe is generated. If you were to set up a "standard" board's oscillator and counters to generate conversion clocks at 10 kHz, you would perform 10,000 conversions each second, regardless of the number of input channels that were selected. The RTI-2100 series has an advanced capability that we call "block mode" acquisition. This feature allows you to generate a number of A/D conversion strobes for each pulse from the oscillator and counter section. These conversion strobes will be at the maximum rate of the A/D converter (i.e., 1 microsecond for the RTI-2100 models). The number of strobes is determined by a software parameter known as "burst_length." Whatever number (up to 256) that is

assigned to this variable indicates the number of 1 microsecond-separated strobes generated for each input pulse. For example, if the output from the timing section was 10 kHz and the "burst_length" parameter set to 4, all four channels would be acquired 10,000 times per second. The four channels would be acquired within a total of 4 microseconds. To achieve true Simultaneous Sample & Hold (SS&H) on the RTI-2100-DS models, this mode must be activated by selecting a value for "burst_length" other than 0 or 1. In fact, if you were to use a non-SS&H board, you could use this capability to perform pseudo-S&H operations. You don't have dedicated hardware to actually lock in and hold the analog values to be digitized, but it does give a nice low-cost "pseudo" solution for this. Note: If your channel list is less than your "burst_length" parameter, the channel list will loop through the list enough times to perform the acquisition. If your channel list is greater than your "burst_length" parameter, it will proceed down the channel list until the block is completed, and continue on through the list on the next input pulse. Also, realize that since a single pulse from the clocking section is generating a number of actual conversion pulses, care needs to be taken not to overrun the A/D converter's maximum rate. If you had set up the clocking section to generate pulses at 100 kHz, and your "burst_length" were set to 12, you would get an overrun error (100 kHz × 12 = 1.2 MHz).

Q: How often do I get data transfers down to the host?

A: As data is acquired, it travels through the DSP and is loaded into a 1k × 16-bit FIFO for transfer to the host. When the FIFO is 1/4 full, an interrupt is generated or a bit is set indicating this condition. The host software then transfers this data down to its memory. The DSP can be set to pack the data stream (default) or not. If packing is enabled, it takes 340 data points to bring the FIFO to the 1/4 full point. If packing is disabled, it takes 256 samples to get to the 1/4 full point.

Q: How do the RTI-2100 series' external trigger and clock work?

A: The RTI-2100 external trigger is a simple, yet highly efficient, mechanism that allows for control well beyond that of "standard" Schmidt trigger-type circuits. Basically, the RTI-2100 external trigger line is connected through an AND gate to the internal clocking circuitry. If the external clock pin is high, the conversion pulses are ANDed with a 1 so they pass to the converter. If it's low, they're ANDed with a 0, and the conversions do not go through. This allows the RTI-2100 to be integrated more completely into applications where data is transferred via various handshaking schemes. If there is nothing connected to the external trigger pin, it's set high via a 2k pull-up resistor. The same connector pin that is used for the external trigger doubles as an external clock. This is selected by setting the "ad_clock_src" parameter in the "Config_bd" function. If it's set to the internal clock, the pin is a trigger. If it's set to an external clock, the pin is now an external clock. The external clock can be used with "block mode" acquisitions. Note: The RTI-BNC termination panel has circuitry on it that enables the RTI-BNC series to react to a high or low, level- or edge-sensitive trigger.

Q: On the main connector, I see pins for +12 V, –12 V, +STRB and –STRB. What are these for?

A: The +12 V and –12 V are used to power circuitry on external ADI termination panels such as the triggering on the RTI-BNC and the high-speed multiplexer panels. They should not be used to power custom circuitry. The +STRB and –STRB are differentially driven signals used to synchronize and provide handshaking between the RTI-2100 and the high-speed multiplexing panels: the RTI-AMUX, RTI-5BMUX and RTI-7BMUX.

Q: What accessories do I need with the RTI-2100?

A: The RTI-2100 comes with everything needed that goes inside the PC. This includes the board and the RTI-STAT software. All that's needed is connection to the outside world. There are two 50-pin male IDC style ribbon cable header connectors on the RTI-2100. One is for the analog I/O, external clock and external trigger. The other is for the 24 digital I/O lines. To make sensor connection easier, Analog Devices offers a family of analog termination panel options. The RTI-STP is a "Phoenix" screw terminal panel that allows you to loosen a screw, insert a wire and tighten the screw to hold the wire in place. The RTI-AMUX panel also provides screw terminals to connect 0 V to +5 V or ±5 V analog I/O and TTL level clock/trigger signals. An expansion 50-pin connector is provided on the RTI-AMUX to connect up to a total of 32 RTI-AMUX Panels in series—facilitating a total of 512 SE or 256 DI analog input channels. The RTI-BNC has the analog I/O, external clock and external trigger interfaced to BNC (female) connectors. The RTI-5BMUX and RTI-7BMUX panels accept up to 16 5B Series or 7B Series signal conditioning modules. An expansion connector is also provided to connect up to 32 RTI-5BMUX or 32 RTI-7BMUX panels in series to a single RTI-2100 board, facilitating a total of 512 analog input and four analog output channels.

Q: What is the importance of using a shielded cable for the analog I/O?

A: Analog Devices highly recommends that even if you are considering building a custom termination interface in place of the panels described above, the RTI-CAB (18 inch length), RTI-CAB-01 (1 meter length) or their equivalent be used. Sampling speeds of 1 MHz are a whole new area for data acquisition. The greater noise levels associated with these higher sampling rates require that a greater degree of noise protection be used. The RTI-CAB and RTI-CAB-01 are shielded cables with a 50-pin female header connector on each end. They are specifically designed to help eliminate these higher noise levels.

USING THE RTI-2100 MULTIPLEXER PANELS

The RTI-MUX series is a family of multiplexer panels designed to facilitate high speed, multichannel scanning when used with the RTI-2100 series of Data Acquisition Boards. For example, when used with model RTI-2100-D board, it is possible to scan a total of 512 analog input channels at a maximum rate of 1.95 kHz/channel. The following frequently asked questions will assist the user in understanding the features of an RTI-2100 Series data acquisition system using expansion panels.

Q: What is an RTI-MUX?

A: RTI-MUX refers to any of the RTI-2100 series high speed multiplexer panels—RTI-AMUX, RTI-5BMUX or RTI-7BMUX.

Q: What is the difference between the RTI-AMUX, RTI-5BMUX and RTI-7BMUX?

A: RTI-AMUX is a 16-channel multiplexing screw terminal panel used for preconditioned analog 0 V to +5 V or ±5 V signals. RTI-5BMUX is a 16-channel multiplexing panel for Analog Devices' 5B Series signal conditioning I/O modules.

RTI-7BMUX is a 16-channel multiplexing panel for Analog Devices 7B Series signal conditioning I/O modules.

Q: What RTI-2100 Series Data Acquisition Boards are supported by the multiplexer panels?

A: The RTI-2100-LC, RTI-2100-D, RTI-2100-DA, RTI-2100-PGL and RTI-2100-PGH are supported by the RTI-AMUX. The RTI-2100-LC, RTI-2100-D and RTI-2100-DA are supported by the RTI-5BMUX and RTI-7BMUX.

Q: Why are the RTI-2100-DSx and RTI-2100-PGSx simultaneous sampling boards not supported?

A: The RTI-MUX scans each group of 16 channels in subgroups of four channels; therefore, this is a sequential process that would not be compatible with the sample and hold architecture.

Q: How many channels does an RTI-MUX system support?

A: Analog input channels, 512 maximum; Analog output channels, four maximum (accessible on each RTI-MUX).

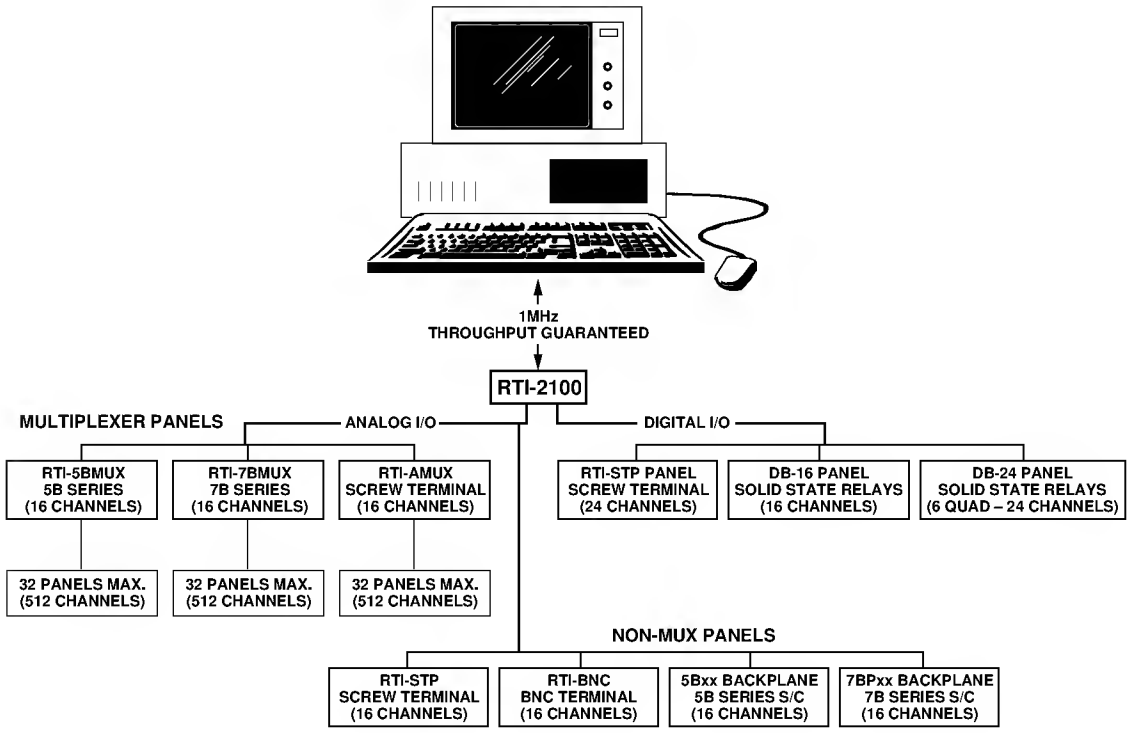

Figure 1.

Q: What is the maximum length of the RTI-MUX cabling?

A: 100 feet from the RTI-2100 board to the last RTI-MUX panel. Each RTI-MUX is supplied with an RTI-CAB (18" shielded cable).

Q: Can I upgrade the RTI-MUX once my system has been configured?

A: Yes. You can have up to 32 RTI-MUX panels connected to one RTI-2100 board. Remember, you can have up to eight RTI-2100 boards in one PC.

Q: How many RTI-MUX panels can I attach to one RTI-2100 board?

A: Up to 32 panels can be multiplexed on one RTI-2100 board.

Q: Can I attach different RTI-MUX panels on one RTI-2100 board?

A: You can attach the RTI-AMUX to a RTI-5BMUX or RTI-7BMUX system. You cannot attach RTI-5BMUX and RTI-7BMUX panels together.

Q: The RTI-5BMUX and RTI-7BMUX look very similar. What's the difference?

A: The RTI-5BMUX and the RTI-7BMUX use the same printed circuit board, but the placement of the modules are only populated for 5B or 7B modules, hence the two different models.

Q: Can you place the RTI-5BMUX or RTI-7BMUX panel in a 19" rack?

A: Yes. You will require the RM-02 19" rack mount kit from Analog Devices. This kit is supplied with screws for mounting the multiplexer panel into the rack mount kit.

Q: You have analog output signals on the RTI-MUX panels. Why?

A: The RTI-2100-DA, RTI-2100-PGL and RTI-2100-PGL have four analog output channels. As a convenience, we have added these output connections to all the RTI-MUX panels. These are direct connections to the analog output ports; these channels are not multiplexed.

Q: What software is available for the RTI-MUX panels?

A: The following software is available to assist the user:

MUXTEST for Windows – Diagnostic program that verifies the analog readings on the RTI-MUX panels.

RTI-STAT for Windows – This is an oscilloscope based package that will read all the active RTI-MUX panels and display the results. It includes many data analysis tools.

RTI-DAQ for Windows – This supports register level programming of the RTI-MUX.

RTI-LVDRV – LabVIEW* for Windows drivers.

Q: How does the RTI-MUX multiplex the A/D signals?

A: The RTI-MUX samples in groups of 16 single-ended channels, RTI-5BMUX and RTI-7BMUX, and 16 single-ended or 8 differential channels, RTI-AMUX. Each channel corresponds to an RTI-2100 analog input channel; hence, you have a 1 to 1 channel correlation. You do not have one analog channel controlling the RTI-MUX. All available channels on the RTI-2100 board are used. Your system must be configured to scan each RTI-MUX using all available channels on your RTI-2100 board.

Q: Do we have to be concerned about settling time between RTI-MUX channels?

A: Absolutely not. The RTI-MUX predicts the next four channels to be acquired and prepares the RTI-MUX circuitry; hence, no settling time problems exist.

Q: What it the maximum sampling rate on the RTI-MUX?

A: Sampling rate is controlled by the RTI-2100 Series board, RTI-2100-LC: 500 kHz. RTI-2100-D, RTI-2100-DA, RTI-2100-PGL and RTI-2100-PGH: 1 MHz.

Q: What power supply is required for the RTI-MUX panels?

A: RTI-AMUX panels require an external +5 V dc, ±5% (250 mA, max).

RTI-5BMUX panels require an external +5 V dc, ±5% (250 mA, max—not including requirements of 5B Series modules).

RTI-7BMUX panels require an external +24 V dc (250 mA, max—not including requirements of 7B Series modules).

In addition, the RTI-2100 Series board provides ±12 V dc (±1 mA) power for the multiplexer circuit via the RTI-CAB cable. You cannot power the RTI-MUX panels from the RTI-2100 board alone; an external power supply must be supplied.

*LabVIEW is a trademark of National Instruments.

Q: Can I connect digital I/O to the RTI-2100 board along with the analog I/O multiplexer panels?

A: Yes. However, because the RTI-MUX panels use Port B of the digital I/O section on the RTI-2100 board for control of the multiplexer scanning, digital signals should not be connected to the Port B pins of the J2 DIO connector on the RTI-2100 board. This results in a total digital channel capability of 16 DIO channels (Port A and Port C) when the analog I/O expansion multiplexer panels are used with digital I/O panels. When the non-muxed analog input panels are used, such as the 7BP16-1 or 5B01, the total digital capability is 24 DIO channels.

UNDERSTANDING ANALOG DEVICES' LabVIEW* DRIVER: MODEL RTI-LVDRV

RTI-LVDRV is a driver package for National Instruments' LabVIEW for Windows, provided by Analog Devices for users of the RTI-2100 series of Data Acquisition boards (RTI). This application note provides information to assist both experienced and new users of LabVIEW, to better understand how the RTI-LVDRV driver software works with National Instrument's LabVIEW software.

FEATURES

- **The RTI-LVDRV driver package provides full support for the RTI-2100 family of data acquisition boards under LabVIEW.**
- **Functions supported include analog and digital I/O and waveform acquisition.**
- **The package includes full support for 1 MHz data acquisition, using the ADI ADSP-2101 processor. The amount of data that may be acquired, even at 1 MHz, is limited only by the amount of memory available to Windows.**
- **RTI-LVDRV LabVIEW analysis library provide a variety of signal processing functions such as FFTs, IFFTs, Hilbert transforms, Windows functions, spectrum analysis functions, convolution and filtering. Also included are functions previously unavailable for LabVIEW such as Chirp-Z transforms and 4-term Blackman-Harris Window functions.**
- **The demonstration versions of both the drivers and the analysis library come complete with full documentation in the form of Windows help files.**

Q: What does RTI-LVDRV for LabVIEW consist of?

A: RTI-LVDRV consists of four components:

• *A set of LabVIEW Virtual Instruments (VIs).* These form the visible part of RTI-LVDRV for LabVIEW. These are very similar to the standard LabVIEW data acquisition functions, supporting single sample analog I/O, waveform I/O, digital I/O plus all the required utility and configuration functions.

• *RTIDAQ DLL (Dynamic Link Library).* This DLL is common to all RTI-2100 data acquisition boards operating under Windows. It provides basic I/O services to the VIs and ensures that access from different Windows programs is synchronized.

• *RTI-DAQV VxD (Virtual Device Driver).* This is a companion driver program to the RTIDAQ.DLL. It handles all time-critical driver functions directly, without the overhead of Windows "ring transitions."

• *Online help.* The entire RTI-LVDRV manual is provided as a Windows online help file. This file is automatically installed at the same time as the rest of the system. A hard copy of the RI-LVDRV manual is available as an option.

Q: What do the drivers actually look like when I use them?

A: The drivers appear exactly as if they were an integral part of the LabVIEW software. An "RTI-LVDRV" Library simply appears under the "VI. . ." section of the standard menu alongside the other LabVIEW functions. This contains all the RTI-LVDRV for LabVIEW VIs. Once they are incorporated into your programs, they act just like any other VI.

Q: Are the RTI-LVDRV VIs exactly the same as the LabVIEW VIs?

A: No. Functionally, they do the same things, but because of the differences in architecture between the National Instruments boards and the Analog Devices boards, there are differences. For example, RTI-2100 boards do not support National Instruments' RTSI bus.

Q: These VxDs and DLLs—how easy is it to install your drivers?

A: Very easy. All you need to do is run "a:\setup" from the Windows Menu. The setup program automatically detects where LabVIEW is installed and installs RTI-LVDRV into the appropriate directory. It also automatically installs the RTIDAQ.DLL and VxD.

Q: How do the DLL and VxD fit together?

A: The basic structure is shown below:

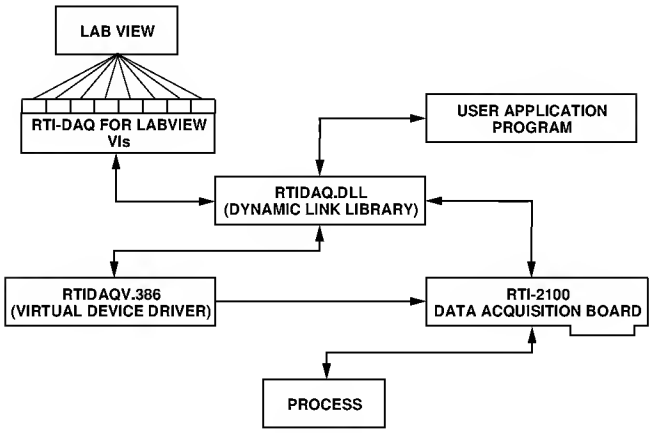

Figure 2.

In effect, the DLL serves to provide basic I/O operations as well as synchronization for multitasking. The VxD provides high speed service to the hardware for time critical functions such as interrupts and DMA.

Q: Will RTI-DAQ for LabVIEW interfere with my National Instruments GPIB board? . . .with my National Instruments data acquisition board?

A: No, you can still use any National Instruments GPIB or data acquisition board at the same time you use RTI-LVDRV.

Q: What about this VxD? National Instruments also uses a VxD. Do I use one or the other? or both?

A: You must have the RTIDAQ VxD installed on your system for the RTI-2100 to work with LabVIEW. Whether or not you have the National Instruments VxD installed makes no difference to the RTIDAQ VxD. It is ignored completely.

Q: National Instruments' VxD replaces some of the VxDs supplied with Windows. What do you do?

A: The RTI-DAQ VxD works together with Windows if there is a data acquisition in progress. In fact, if there isn't a data acquisition operation occurring, it does nothing at all.

Q: This analysis library that you supply: Does it replace the LabVIEW library?

A: Not entirely. What we have done is taken the most frequently used functions, such as FFTs, IFFTs, spectrum analysis and filtering functions, and provided them in the RTI-LVDRV package. But the RTI-LVDRV package does not have nearly as many functions available as the LabVIEW analysis package.

Q: Are the functions in your analysis library "pin-for-pin" replacements for the National Instruments VIs?

A: Most, but not all, can be substituted directly. But there are subtle differences that you need to be aware of. For example, the RTI-LVDRV Blackman-Harris window function is a 4-term "exact," 92 dB side lobe suppression window, while the National Instruments version is a 3-term, approximate 67 dB window.

Q: What's this Chirp-Z function you have?

A: A Chirp-Z transform is very similar to an FFT, but because an FFT's frequency resolution is fixed at the sampling frequency divided by the number of samples in the data, the resolution of the Chirp-Z can be made as fine as you want it.

Q: Sounds good. How do I get a closer look?

A: The RTI-2100 Series LabVIEW Demo disk is a demonstration version of the RTI-LVDRV LabVIEW Driver Disk which emulates the responses of the RTI-2100 data acquisition board and allows the user to evaluate the RTI-LVDRV software and review the on-line manual before purchasing an RTI-2100 Series board. (Note: LabVIEW 3.1/4.0 for Windows must be installed on the computer to use this software.) Also included is an uninstall option which allows the user to completely remove the demonstration software from their system after they have finished evaluating the software.

Q: How do I get this diskette?

A: It's available at no charge from Analog Devices.

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